

6.0 Update and Screening Assessment for Nitrogen Dioxide

6.1 The national perspective

Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen. Together they are collectively referred to as NO_x. All combustion processes produce NO_x emissions, largely in the form of NO which is then converted in the atmosphere to NO₂.

The principal source of NO_x emissions is road transport. Motorways which carry large volumes of high speed traffic are a predominant source, as are roads in congested city centres where there are large volumes of slow moving traffic combined with poor natural dispersion.

The contribution of road transport to NO_x emissions has declined significantly in recent years due to the introduction of tighter vehicle emission standards. Further reductions are expected to occur up to and beyond 2010. For example, urban traffic NO_x emissions are estimated to fall by about 20% between 2000 and 2005, and by 46% between 2000 and 2010.

Other significant sources of NO_x emissions include the electricity supply industry and the commercial sector. Emissions from both these sectors have also been dramatically reduced in recent years due to the introduction of low NO_x burners and the widespread replacement of solid fuel boiler plant with natural gas.

The majority of the 100-plus AQMA's which have already been declared in the UK are based on predicted exceedances of the 2005 annual average nitrogen dioxide objective due to traffic emissions.

6.2 The local perspective

In the First Stage Review and Assessment of Air Quality in York nitrogen dioxide was assessed against the following objectives:

'An hourly average of 150ppb not to be exceeded by the end of 2005.'

'An annual average of 21ppb not to be exceeded by the end of 2005'

It was concluded that the hourly objective would be met in York without the need for further action at a local level but that a more detailed review and assessment against the annual average objective should be undertaken.

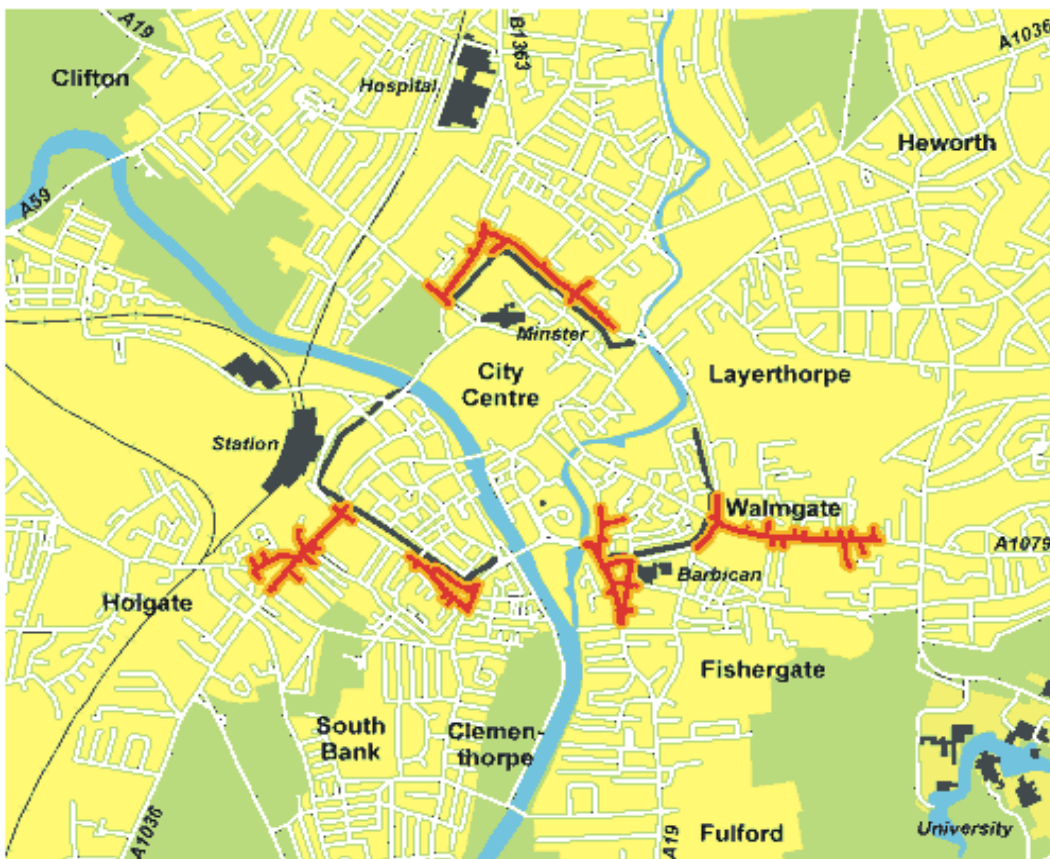
In the Second and Third Stage Review and Assessment of Air Quality in York nitrogen dioxide was assessed against the following objectives:

'A one hour mean of 200µg/m³ (105ppb), not to be exceeded more than 18 times a year, to be achieved by the end of 2005.'

'An annual mean of $40\mu\text{g}/\text{m}^3$ (21ppb) to be achieved by the end of 2005'

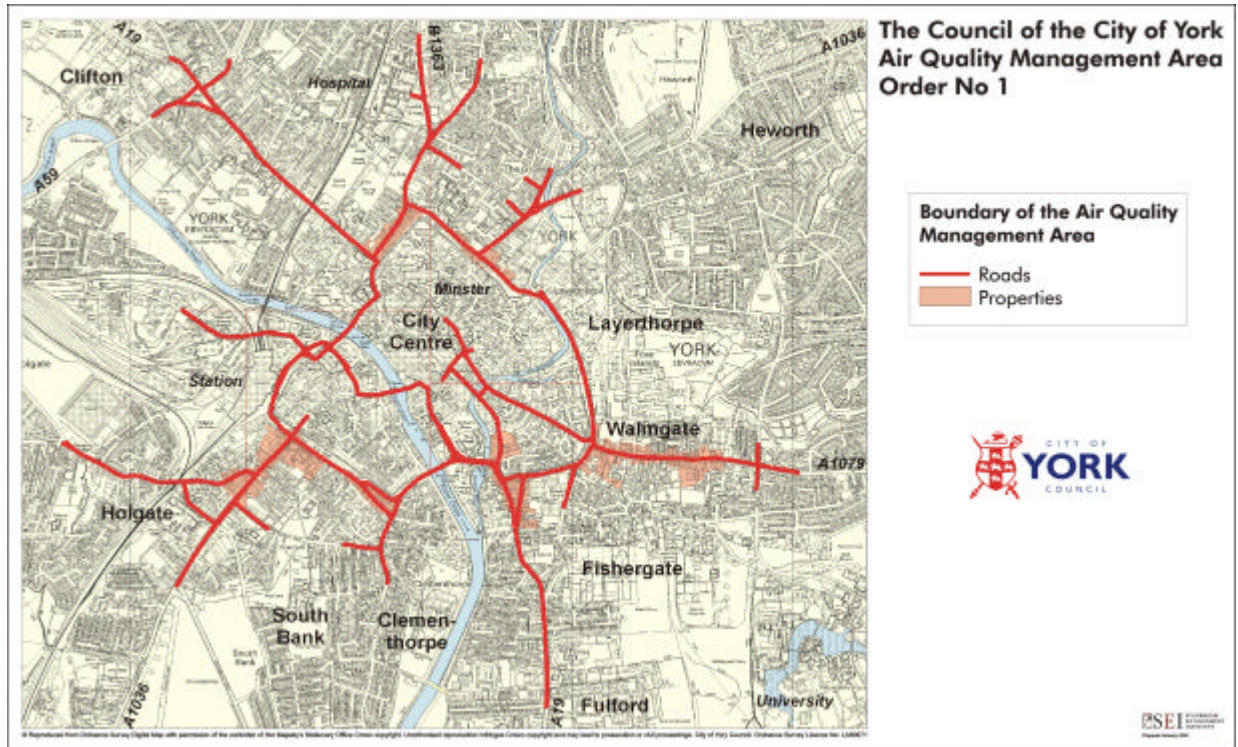
The Second and Third Stage Review and Assessment of Air Quality in York concluded that an AQMA should be declared based on the potential for exceedances of the annual average objective to occur in a small number of areas in the city. Figure 4 shows the areas of potential exceedance identified in the Second and Third Stage Review and Assessment of Air Quality in York.

Figure 4: Areas of potential exceedance of the annual average nitrogen dioxide objective identified in the Second and Third Stage Review and Assessment of Air Quality in York



Following a period of extensive public consultation, an AQMA was declared in York on 21st January 2002. The area covered by the current AQMA is shown in Figure 5.

Figure 5: Area covered by the Council of the City of York Air Quality Management Area Order N^o.1



Further details of the AQMA declaration process can be found in the Interim Fourth Stage Review and Assessment of Air Quality in York which was submitted to DEFRA in January 2003.¹ This document also contains the most recent review and assessment of nitrogen dioxide concentrations within the AQMA. The Interim Fourth Stage Review and Assessment of Air Quality in York concluded that the declaration of the AQMA in York is valid and that there is currently no requirement to amend the boundaries of the York AQMA.

6.3 Scope of the update and screening assessment for nitrogen dioxide

For the purpose of this update and screening assessment nitrogen dioxide has been assessed against the current objectives which are:

'An annual mean of 40mg/m³ or less to be achieved by the end of 2005.'

'A one hour mean of 200µg/m³ (105ppb), not to be exceeded more 18 times per year by the end of 2005.'

¹ CITY OF YORK COUNCIL Interim Fourth Stage Review and Assessment of Air Quality in York
January 2003

In accordance with the air quality guidance note LAQM.TG(03) the following items have been considered:

- Monitoring data outside the AQMA
- Monitoring data inside the AQMA
- Narrow congested streets with residential properties close to the kerb
- Busy streets where people spend 1-hour or more close to traffic
- Roads with high flows of buses and/or HGV's
- New roads constructed or proposed since the first round of reviews and assessments
- Roads close to the objective during the first round of reviews and assessments
- Roads with significantly changed traffic flows
- Bus stations
- New industrial sources
- Industrial sources with substantially increased emissions
- Aircraft

6.4 Assessment of nitrogen dioxide monitoring data for the area outside the AQMA

6.4.1 Nitrogen dioxide monitoring results from real time monitoring stations outside the AQMA

City of York Council has undertaken real time air pollution monitoring at five locations outside the AQMA. These are:

Clifton Moor	– roadside monitoring site
Rawcliffe	– roadside monitoring site
Bootham	– urban background site
Dunnington	– sub-urban background site
City Centre	– city centre site

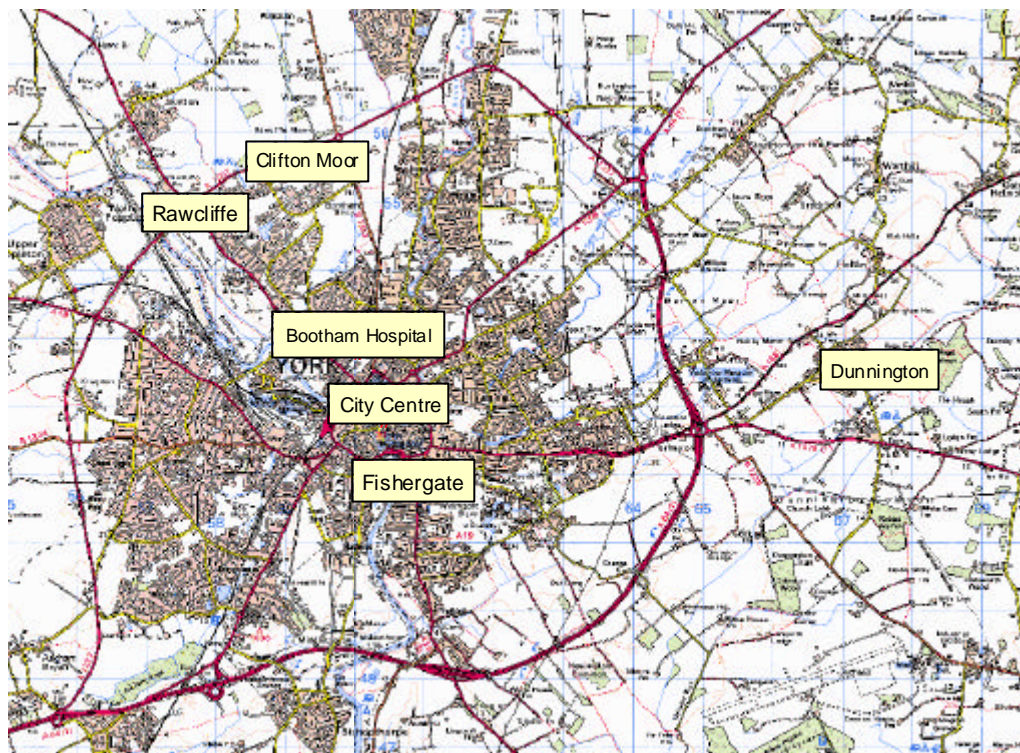
The location of these monitoring sites in relation to the AQMA are shown on Figure 6

The results of the nitrogen dioxide monitoring undertaken at these sites are shown in Table 5. Full information about the air pollution station locations, data management procedures and other QA/QC procedures for the real time air pollution stations have been previously documented as part of the Second and Third Stage Review and Assessment of Air Quality in York.²

In October 2000 the air pollution station previously located at Clifton Moor was moved to the present location at Rawcliffe. As a result of this move the data sets for these two sites between 01/04/00 and 31/03/01 are incomplete.

² CITY OF YORK COUNCIL Second and Third Stage Review and Assessment of Air Quality in York – Technical Annex 2: Air Quality Monitoring in York Feb 2001

Figure 6: Locations outside the AQMA where real time monitoring of nitrogen dioxide has been undertaken



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Table 5: Summary of real time nitrogen dioxide monitoring results for locations outside the AQMA

Parameter	Station	01/04/99	01/04/00	01/04/01
		to 31/03/00	to 31/03/01	to 31/03/02
maximum hourly concentration ($\mu\text{g}/\text{m}^3$)*	Clifton Moor	136	-	-
	Rawcliffe	-	-	124
	Bootham	88	97	94
	Dunnington	80	76	82
	City Centre	149	97	147
annual mean concentration ($\mu\text{g}/\text{m}^3$)	Clifton Moor	31	-	-
	Rawcliffe	-	-	34
	Bootham	23	25	23
	Dunnington	21	19	14
	City Centre	52	34	32
percentage data capture	Clifton Moor	95%	-	-
	Rawcliffe	-	-	98%
	Bootham	98%	77%	84%
	Dunnington	52%	98%	89%
	City Centre	48%	45%	85%

* ppb to $\mu\text{g}/\text{m}^3$ conversion factor =1.91

6.4.2 Predicted 2005 concentrations based on data from real time monitoring stations outside the AQMA

The technical guidance note LAQM.TG4(00) provides correction factors for estimating nitrogen dioxide concentrations in future years based on monitored data. To correct the real time monitoring data shown in Table 6 the following correction factors have been used:

- For measurements taken in 2000/2001, multiply by 0.864 for roadside and kerbside sites and 0.886 for intermediate and background sites.
- For measurements taken in 2001/2002, multiply by 0.892 for roadside and kerbside sites and 0.908 for intermediate and background sites.

The predicted 2005 annual average nitrogen dioxide concentrations are shown in Table 6.

Table 6: Predicted 2005 nitrogen dioxide concentrations based on results from real time monitoring stations outside the AQMA

Monitoring site	Predicted 2005 annual average based on 2000/2001 data ($\mu\text{g}/\text{m}^3$)	Predicted 2005 annual average based on 2001/2002 data ($\mu\text{g}/\text{m}^3$)
Rawcliffe	-	30
Bootham Hospital	22	21
City Centre	30	29
Dunnington	17	13

As can be seen from Table 6 no breaches of the annual average nitrogen dioxide objective are predicted at any of the real time monitoring locations outside the AQMA.

6.4.3 Nitrogen dioxide monitoring results from diffusion tube monitoring sites outside the AQMA

As well as real time monitoring City of York Council also undertakes nitrogen dioxide diffusion tube monitoring at over 300 locations in the city.

Details of the surveys undertaken since the completion of the Second and Third Stage Review and Assessment of Air Quality in York are given in Table 7.

Table 7 : Nitrogen dioxide diffusion tube monitoring surveys undertaken since the completion of the Second and Third Stage Review and Assessment of Air Quality in York

Survey	Area Monitored	Number of tubes exposed per month	Monitoring Period
city wide survey 3	city wide	60	July 2000 – June 2001
city wide survey 4	city wide	65	July 2001 – June 2002
survey A	A19 (north) A59 / Leeman Road Area	84	August 2000 – July 2001
survey A	A19 (north) A59 / Leeman Road Area	84	August 2001 – July 2002
survey B	Huntington Road / Malton Road / A1079	71	August 2000 – July 2001
survey B	Huntington Road / Malton Road / A1079	73	August 2001 – July 2002
survey C	A19 (south) Tadcaster Road	54	August 2000 – July 2001
survey C	A19 (south) Tadcaster Road	55	August 2001 – July 2002
survey D	inner ring road and city centre	33	August 2000 – July 2001
survey D	inner ring road and city centre	46	August 2001 – July 2002

As reported in the Second and Third Stage Review and Assessment of Air Quality in York³, all the nitrogen dioxide diffusion tubes used in York are supplied and analysed by Lambeth Scientific Services, Arlington Lodge, 26 Wanless Road, London, SE24 OHW.

The accuracy of the diffusion tubes are monitored on a month by month basis by co-locating diffusion tubes with the inlets to four of the real time chemiluminescence analysers operated in the city.

The precision of the diffusion tubes are monitored by co-locating diffusion tubes at five sites in the city.

The methodology used to calculate the accuracy and precision of the diffusion tubes in York was fully documented in 'Technical Annex 2: Air Quality Monitoring in York'⁴, which was submitted with the Second and Third Stage Review and Assessment of Air Quality in York. Details of the calculations undertaken to obtain the accuracy and precision factors used in this report can be found in Appendix 6 of the Interim Fourth Stage Review and Assessment of Air Quality in York⁵.

Results for the tubes located inside the AQMA were recently reported in the Interim Fourth Stage Review and Assessment of Air Quality in York which was submitted to DEFRA in January 2003.

Locations and results for the diffusion tubes outside the AQMA are detailed below.

³ CITY OF YORK COUNCIL Second and Third Stage Review and Assessment of Air Quality in York Feb 2001

⁴ CITY OF YORK COUNCIL Second and Third Stage Review and Assessment of Air Quality in York – Technical Annex 2: Air Quality Monitoring in York Feb 2001

⁵ CITY OF YORK COUNCIL Interim Fourth Stage Review and Assessment of Air Quality in York Jan 2003